Flight Adaptive Blade for Optimum Rotor Response (FABFORR)

Continuum Dynamics, Inc.

Technical Abstract

While past research has demonstrated the utility and benefits to be gained with the application of advanced rotor system control concepts, none have been implemented to date on a production military or commercial rotorcraft. A key contributor to this fact is the inherent cost associated with installation and maintenance of these control systems, since many system designs require the replacement of a helicopter's rotor blades, rotor hub components, or both. The proposed work addresses this deficiency through the development of an on-blade full-span camber control system that reaps many of the known benefits of advanced rotor control in a retrofit design approach that has the potential to achieve production status due to its lower risks and costs compared to previous system concepts. The design leverages past work in the use of smart-material actuated bistable tabs for rotor blade tracking, with a newer integral actuation concept that will lead toward a more robust and flightworthy design.

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Stochastic Queuing Model Analysis to Support Airspace Super Density Operations (ASDO)

Optimal Synthesis, Inc.

Technical Abstract

NASA has been involved in extensive research efforts to develop advanced concepts and technologies, for the Next Generation Air Transportation System (NextGen) under different Research Focus Areas (RFAs). The Airspace Super Density Operations (ASDO) RFA seeks to develop efficient terminal area operations. It is expected that multiple ASDO concepts will be interacting with one another in a complex non-deterministic manner. Therefore, the overall terminal system performance may not be a straightforward combination of individual performance indices. It is also crucial that the overall system performance be robust to wind and operational uncertainties. The proposed research effort seeks to develop a fast-time, stochastic analysis tool based on queuing theory that can be used to evaluate the interaction and combined performance of multiple ASDO concepts. The utility of the approach was demonstrated under Phase I research. Phase II research seeks to achieve the following: (i) make enhancements to the modeling and simulation aspects of the approach, (ii) accelerate the stochastic simulation execution time using high-performance computing solutions, (iii) create software plug-ins for existing NASA research tools, (iv) conduct studies of NextGen terminal area concepts using the queuing simulation, and (v) develop a conflict free scheduling algorithm based on the queuing simulation.

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